Hospital characteristics and hospital-acquired infections in the United States

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BACKGROUND

- Hospital-acquired infections (HAIs) are preventable conditions that cause substantial morbidity and mortality in hospitals throughout the United States. [1]
- There are approximately 100,000 deaths and $45 billion in healthcare expenses attributed to hospital-acquired infections in the United States annually. [2]
- There have been notable differences in the prominent types of HAIs between individual hospitals. [3]

PURPOSE

To examine the relationship between hospital characteristics (academic status, ownership, urban-rural location, and size) and hospital-acquired infections in the most and least affected states in the United States.

METHODS

- A retrospective cohort study using data from the Centers for Medicare and Medicaid Services on HAIs by state.
- Six types of HAIs were assessed by standardized infection ratios (SIRs).
- SIRs were categorized as low (SIR≤1) or high (SIR>1) (adequate or inadequate infection control, respectively) consistent with national guidelines.
- The most and least affected states were determined by the highest and lowest proportion of adequate SIRs.
- The association among hospital-level characteristics and HAIs was evaluated through binary logistic regression adjusting for potentially influential covariates.

RESULTS

- Arizona had the least burden of SIRs while Rhode Island had the greatest.
- Hospital ownership and size was shown to be associated with the state in which the hospital was located.
- Hospitals in Rhode Island were more likely than Arizona hospitals to report high SIRs for CLABSIs, CAUTIs, and C. *difficile* infections.
- Public and private, non-profit hospitals were more likely than for-profit hospitals to have high SIRs for colectomy surgical site infections.

Hospital Characteristics in the Most and Least Affected States

	Arizona (n=52)	New Jersey (n=64)	Rhode Island (n=11)	Utah (n=26)	*P* value
Academic Status – no. (%)					0.143
Teaching	30 (50.7%)	39 (60.9%)	6 (54.5%)	9 (34.6%)	
Non-Teaching	22 (42.3%)	25 (39.1%)	5 (45.5%)	17 (65.4%)	
Ownership – no. (%)					**0.007
Public & Private, Non-Profit	40 (76.9%)	56 (87.5%)	9 (81.8%)	14 (53.8%)	
Private, For-Profit	12 (23.1%)	8 (12.5%)	2 (18.2%)	12 (46.2%)	
Size – no. (%)					**0.003
Small	34 (65.4%)	27 (42.2%)	8 (72.7%)	21 (80.8%)	
Large	18 (34.6%)	37 (57.8%)	3 (27.3%)	5 (19.2%)	

Analysis of Hospital Characteristics and SIRs

	Standardized Infection Ratio (SIR)					
	CLABSI OR, [95% CI]	CAUTI OR, [95% CI]	SSI Colectomy OR, [95% CI]	SSI Hysterectomy OR, [95% CI]	MRSA OR, [95% CI]	C. *difficile* OR, [95% CI]
State						
New Jersey ref: Arizona (least HAIs)	1.62 [0.58, 4.48]	**3.21 [1.19, 8.70]	**0.32 [0.12, 0.85]	2.14 [0.44, 10.32]	2.73 [1.01, 7.37]	2.13 [0.91, 4.96]
Rhode Island ref: Arizona (least HAIs)	**4.97 [1.04, 23.77]	**8.60 [1.65, 44.82]	1.71 [0.25, 11.85]	insufficient sample size	0.58 [0.06, 6.06]	**6.02 [1.48, 24.42]
Utah ref: Arizona (least HAIs)	0.50 [0.09, 2.93]	**3.88 [1.06, 14.23]	**5.63 [1.12, 28.29]	**20.19 [1.72, 236.46]	0.77 [0.13, 4.72]	2.73 [0.97, 7.66]
Academic Status						
Teaching ref: Non-Teaching	1.56 [0.57, 4.32]	1.12 [0.45, 2.79]	1.91 [0.63, 5.74]	1.48 [0.22, 9.93]	0.61 [0.23, 1.64]	0.65 [0.29, 1.46]
Ownership						
Public & Private, Non-Profit ref: Private, For-Profit	0.34 [0.11, 1.03]	0.94 [0.35, 2.56]	**8.02 [1.84, 34.88]	18.15 [0.78, 423.79]	0.43 [0.13, 1.38]	0.97 [0.41, 2.33]
Size						
Small ref: Large	1.21 [0.46, 3.23]	1.41 [0.57, 3.49]	1.94 [0.69, 5.47]	1.60 [0.20, 12.53]	1.13 [0.42, 2.99]	0.72 [0.31, 1.70]

**Designates significance
CLABSI: Central-Line Associated Bloodstream Infection; CAUTI: Catheter-Associated Urinary Tract Infection; SSI: Surgical Site Infection; MRSA: Methicillin-Resistant *Staphylococcus aureus*; C. *difficile*: *Clostridium difficile*; OR: Odds Ratio; CI: Confidence Interval

CONCLUSIONS

- The state where a hospital is located was shown to be influential with regard to a hospital's SIR.
- We found that state was the most significant predictor of a hospital's infection control performance compared to all other characteristics measured.
- Because public health policy is often regulated and implemented at the state and local levels, it follows that indicators of health would vary by state of residence. [4]
- These findings promote a greater understanding of HAIs as well as introduce new areas that may be critical to target for prevention initiatives.

RECOMMENDATIONS

- The United States must re-prioritize hospital-acquired infections.
- Local and state health departments should develop more thorough methods of evaluating hospital performance in their jurisdictions.
- Hospital administrators and their infection control departments must collaborate and coordinate to develop new prevention policies and practices tailored to the needs of their hospital.

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